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FORM PTO-1390 REV. 5-93	US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEYS DOCKET NUMBER P00,1968
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S.APPLICATION NO. (if known, see 37 CFR 1.5) 09/762625
INTERNATIONAL APPLICATION NO. PCT/DE99/02417	INTERNATIONAL FILING DATE 4 August 1999	PRIORITY DATE CLAIMED 12 August 1998

TITLE OF INVENTION
"METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION"

APPLICANT(S) FOR DO/EO/US
Rolf BIEDERMANN and Klaus MÜHLE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2).

7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).)

10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C.371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included.
    (SEE ATTACHED ENVELOPE)

13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☒ A substitute specification and a marked up version of the specification.

15. ☐ A change of power of attorney and/or address letter.

16. ☒ Other items or information:
    a. ☒ Submittal of Drawings
    b. ☒ **EXPRESS MAIL #EL 655300828US, dated February 9, 2001.**

U.S.APPLICATION NO. (if known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/762625	PCT/DE99/02417	P00,1968

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO . . . . . $860.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $700.00 No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) . . . . . $770.00 Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO . . . . . $1040.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	5 - 20 =		X $ 18.00	$ .00	
Independent Claims	1 - 3 =	1	X $ 80.00	$	
Multiple Dependent Claims			$270.00 +	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
SUBTOTAL =				$ 860.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +					
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded	$
				charged	$

a. ☒ A check in the amount of $ 860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 501519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"**PRELIMINARY AMENDMENT**"

APPLICANT: Rolf BIEDERMANN et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE99/02417

INTERNATIONAL FILING DATE: 4 August 1999

INVENTION: METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

Dear Sir:

Please substitute the existing specification in the file with the enclosed specification in accordance with 37 CFR 1.125(b). Also, a separate version of the substitute specification, marked up to show all changes relative to the previous version of the specification is further enclosed. The enclosed substitute specification contains no new matter.

Amend the above-identified international application before entry into the national stage before the U.S. Patent & Trademark Office under 35 U.S.C. §371 as follows:

IN THE CLAIMS

Please cancel all claims without prejudice and add new claims 6-10 as

follows:

6. A method for controlling data transmission between a data terminal and a data transmission device with a first V.24 data transmission apparatus connected to said data terminal by a first V.24 cable containing data lines, capable of signaling on an RTS state and a CTS state and an RTS status line that signals said RTS state and a CTS status line that signals said CTS state, a second V.24 data transmission apparatus connected to said data transmission device by a second V.24 cable containing data lines and an RTS status line and a CTS status line, with an air interface between said first and second V.24 data transmission apparatuses, said method comprising the steps of :

upon activation of said data terminal, operating said data terminal and said transmission device and said first and second V.24 data transmission apparatuses in a command data transmission mode in which command data are transmitted between the data terminal and the data transmission device;

setting one of a first transmission type, comprising a software hand shake, and a second transmission type, comprising a hardware hand shake, by selectively performing one of:

(a) transmitting, in said command data, one of first data indicating that the software hand shake is to be performed between said data terminal and said data transmission device, and second command data indicating that the hardware hand shake is to be performed between said data terminal and said data transmission device, and

(b) preconfiguring the data terminal and the data transmission device to perform one of a software hand shake and a hardware hand shake;

if (a) occurs, detecting in one of said first and second V.24 data transmission apparatuses, which one of said first and second transmission type is indicated in said command data, said one of said first and second V.24 data transmission apparatuses thereupon informing the other of the first and second V.24 data transmission apparatuses of the detected transmission type;

if said first transmission type is set, switching each of said first and second

V.24 data transmission apparatuses to respective modes for locally handling said RTS and CTS states signaled on said RTS status line and said CTS status line of the respective V.24 cables connected to the first and second V.24 data transmission apparatuses; and,

if said second transmission type is set, switching each of said first and second V.24 transmission apparatuses to respective modes for locally handling said RTS and CTS states signaled in respective data streams in the data lines of the respective V.24 cables connected to the first and second V.24 transmission apparatuses.

7. A method according to claim 6, further comprising the step of: carrying out the software handshake by utilizing an XON/XOFF protocol.

8. A method according to claim 6, wherein the first command data and the second command data are Hayes-specific commands with a Hayes prefix AT.

9. A method according to claim 6, wherein, said data transmission device is a modem and said data terminal is a personal computer.

10. A method according to claim 6, wherein said air interface is a DECT air interface.

REMARKS

The foregoing amendments to the specification and claims under Article 41 of the Patent Cooperation Treaty place the application into a form for prosecution before the U.S. Patent and Trademark Office under 35 U.S.C. §371. Accordingly, entry of these amendments before examination on the merits is hereby requested.

Respectfully submitted,

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ATTORNEY FOR APPLICANT

GR 98 P 8075

Description

Method for controlling data transmission in a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication

Data telecommunication (Datel) is the reciprocal transmission and reception of data or data signals (packet data) between a data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - and a remote data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - via a telecommunications network, for example a public telecommunications network (Stw.: ISDN, PSTN, etc.). So that the data or data signals transmitted by the data terminal can be transmitted via the telecommunications network, a technical network apparatus, referred to as the data transmission device, is provided between the data terminal and the telecommunications network. The most commonly used data transmission device, along with the PC card (formerly known as the PCMCIA card), is the modem (artificial word made up from modulator/demodulator) [cf., inter alia, utility model DE 297 14 588 U1].

The modem is an electrical data transmission device operating on the basis of the carrier method for use on limited-bandwidth analog transmission paths - e.g. telecommunications lines (e.g. a/b line pair, ISDN-S_0 bus, etc.) of the telecommunications network, which converts digital data signals into analog data signals and vice versa, and transmits said signals. A multiplicity of V-series methods standardized by the International Telecommunication Union - Telecommunication Standards (ITU-T) are implemented in modems.

FIGURE 1 shows a data telecommunication scenario on the basis of a V.24 data transmission system. A V.24

data transmission system is connected via a public - e.g. a PSTN (**P**ublic **S**witched **T**elecommunication **N**etwork) having an a/b line pair or an ISDN (**I**ntegrated **S**ervices **D**igital **N**etwork) having an ISDN-S_0 bus - telecommunications network to the remote V.24 data transmission system. The V.24 data transmission system has a data terminal DEE, e.g. designed as a personal computer, and a data transmission device DÜE designed as a modem, which are interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

Analogously, the remote V.24 data transmission system has a remote data terminal DEE_f, e.g. designed as a personal computer, and a remote data transmission device $DÜE_f$, e.g. designed as a modem, which are likewise interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

The data terminal DEE, DEE_f contains a system controller SST with a user interface BOF, application software ASW and a driver TR as an adapter between the software (application software) and the hardware (data transmission device or modem).

The driver TR is modem-vendor-specific and is preferably designed as a CAPI driver (**C**ommon ISDN **A**pplication **P**rogrammable **I**nterface; standardized communications interface with the application software for fault-tolerant ISDN telecommunication with the personal computer) or as a TAPI driver (**T**elephone **A**pplication **P**rogrammable **I**nterface).

A multiplicity of data transmission apparatus DÜE which are available on the market, e.g. analog modems and PC-external ISDN terminal adapters, are controlled via a HAYES command set (HAYES standard). The HAYES standard was originally an American industry standard for modem communication, in particular for modem control by the data

terminal DEE. It is also referred to as the AT standard, since virtually all commands from the HAYES command set begin with the prefix "AT" (**AT**tention) with the ASCII characters A and T. The standard, which has since been introduced worldwide, is the subject of an ITU recommendation (International Telecommunication Union) with the title "ITU-T V.25ter". The prefix "at", the prefix "A/" or the prefix "a/" can also be used instead of the prefix "AT".

According to ITU-T specification V.24, March 1993, pages 1 to 19, the V.24 cable or V.24 interface $K_{V.24}$ supports modem operation on a personal computer through different lines (status lines). These are:

1. A transmit data line TxD for data transmission,
2. a receive data line RxD for data transmission,
3. an RTS line (**R**eady **T**o **S**end) RTS for the "hardware-handshake" transmission type for transmission of the "**R**EADY **T**O **S**END" state ("RTS" state),
4. a CTS line (**C**lear **T**o **S**end") CTS for the "hardware-handshake" transmission type for transmission of the "**C**LEAR **T**O **S**END" state ("CTS" state),
5. an RI line (**R**ing **I**ndication) RI for ring detection, on the modem,
6. a DSR line (**D**ATA **S**ET **R**EADY) DSR, on which the modem signals to the personal computer that it is activated,
7. a DTR line (**D**ATA **T**ERMINAL **R**EADY) DTR, on which the personal computer signals to the modem that it is activated and ready to accept connections,
8. a DCD line (**D**ATA **C**HANNEL **D**ETECTION) DCD, on which the modem signals to the personal computer that it has accepted or set up the connection to a remote modem,
9. A ground line (**G**rou**ND**) GND.

If the V.24 cable or V.24 interface $K_{V.24}$ does not have the nine lines listed above, but has less than nine, e.g. seven, this 7-pin cable can nevertheless support modem operation on the personal computer.

This is done by effecting a "software handshake" instead of the "hardware handshake" on the RTS/CTS line in order to transmit the "RTS", "CTS" states - e.g. by means of an XON/XOFF protocol - on the transmit/receive data lines TxD, RxD. With the "software handshake", the data stream transmitted between the data terminal DEE and the data transmission device DÜE is analyzed, all "software handshake characters" are interpreted and appropriate measures are instigated in the data terminal DEE and the data transmission device DÜE.

The line-connected V.24 data transmission system shown in FIGURE 1 presents the disadvantage, in the case of an application scenario in which the data terminal DEE and the data transmission device DÜE are physically separated from one another, e.g. over several meters, that, firstly, for data telecommunication, a correspondingly long V.24 cable $K_{V.24}$ is required in relation to the physical arrangement of the data terminal DEE and the data transmission device DÜE and that, secondly, significantly high system installation costs are incurred due to the cable laying required for cables of this length.

By analogy with wireless telephony, it is therefore desirable and also conceivable for the line-connected V.24 data transmission system according to FIGURE 1 to be replaced with a wireless V.24 data transmission system.

On the basis of FIGURE 1, FIGURE 2 shows a wireless V.24 data transmission system of this type for data telecommunication. The remote V.24 data transmission system, which is not fully shown in FIGURE 2, may either be line-connected according to FIGURE 1 or wireless in the same way as the wireless V.24 data transmission system in FIGURE 2.

In the wireless V.24 data transmission system, in contrast to the line-connected V.24 data transmission system in FIGURE 1, the V.24 cable and V.24 interface $K_{V.24}$ are

disconnected between the data terminal DEE and the data transmission device DÜE and a data transmission apparatus is in each case connected to the two ends of the cable created by the disconnection.

The two data transmission apparatus, a first data transmission apparatus DÜG1 which is connected to the data terminal DEE via the V.24 cable or V.24 interface $K_{V.24}$ and a second data transmission apparatus DÜG2 which is connected to the data transmission device DÜE via the V.24 cable or V.24 interface $K_{V.24}$ are interconnected via an air interface LSS for wireless telecommunication.

Air interfaces are wireless telecommunication interfaces in which messages are transmitted by wireless means via a remote transmission path between a message source (e.g. first data transmission apparatus DÜG1) and a message sink (e.g. second data transmission apparatus DÜG2) on the basis of diverse communications methods FDMA (**F**requency **D**ivision **M**ultiple **A**ccess), TDMA (**T**ime **D**ivision **M**ultiple **A**ccess) and/or CDMA (**C**ode **D**ivision **M**ultiple **A**ccess) - e.g. according to radio standards such as DECT [**D**igital **E**nhanced (formerly: **E**uropean) **C**ordless **T**elecommunication; cf. *Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29* **in conjunction with** ETSI Publication *ETS 300175-1…9, October 1992,* and the DECT publication of the *DECT Forum, February 1997, pages 1 to 16]*, GSM [**G**roupe **S**pécial **M**obile or **G**lobal **S**ystem for **M**obile Communication; cf. *Informatik Spektrum 14 (1991), June, Issue 3, Berlin, DE; A. Mann: "Der GSM Standard - Grundlage für digitale europäische Mobilfunknetze" ["The GSM Standard - Foundation for Digital European Mobile Networks"], pages 137 to 152* **in conjunction with** the

publication *telekom praxis 4/1993, P. Smolka "GSM Funkschnittstelle - Elemente und Funktionen" ["GSM Radio Interface - Elements and Functions"], pages 17 to 24]*, UMTS [cf. *Funkschau 6/98: R. Sietmann "Ringen um die UMTS Schnittstelle" ["The Fight for the UMTS Interface"], pages 76 to 81]*, WACS or PACS, IS-54, IS-95, PHS, PDC, etc. [cf. IEEE Communications Magazine, January 1995, pages 50 to 57; D.D. Falconer

et al: "Time Division Multiple Access Methods for Wireless Personal Communications"].

In FIGURE 2, the DECT air interface is preferably provided as the air interface LSS. According to the publication *"Vortrag von A. Elberse, M. Barry, G. Fleming zum Thema [Presentation by A. Elberse, M. Barry, G. Fleming on the subject of]: "DECT Data services - DECT in Fixed and Mobile Networks", June 17/18, 1996, Hotel Sofitel, Paris; pages 1 to 12 and abstract"* - on the basis of the document *Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29* **in conjunction with** ETSI Publication *ETS 300175-1...9, October 1992* and the documents *Components 31 (1993), Issue 6, pages 215 to 218; S. Althammer, D. Brückmann: "Hochoptimierte IC's für DECT Schnürlostelefone" ["Highly Optimized ICs for DECT wireless telephones"]* and WO 96/38991 (cf. Figures 5 and 6 with the relevant associated description) - the essential usability of DECT technology (Digital Enhanced Cordless Telecommunication], DECT technology is suitable for wireless mobile remote transmission of voice and/or packet data, in which the user, by means of DECT network access technology relating to the remote transmission of user data, can not only become his own network operator but also has the facility to access a higher-order telecommunications network.

In a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication, the object on which the invention is based entails the control of the transmission of the states "RTS", "CTS" in such a way that reliable reciprocal notification of the state is effected in the wireless V.24 data transmission

system in a simple manner for different state transmission types (hardware handshake or software handshake).

This object is achieved by the features of claim 1.

The idea on which the object is based consists in that, in a wireless V.24 data transmission system operating between a data terminal (e.g. a personal computer) and a data transmission device (e.g. a modem) for data telecommunication, a first data transmission apparatus connected to the data terminal via a V.24 cable and a second data transmission apparatus connected to the data transmission device via a V.24 cable, which in turn can be connected by means of wireless telecommunication via an air interface,

a) in "hardware handshake mode" for transmission of the "RTS", "CTS" states in which status lines RTS, CTS are used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted on these lines in relation to the RTS/CTS status lines,

b) in "software handshake mode" for transmission of the "RTS", "CTS" states in which a data stream transmitted on data lines is used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted in this data stream in relation to this data stream.

This enables the respective V.24 data transmission apparatus, if the input buffer in the relevant V.24 data transmission apparatus overflows with data arriving in the device, to signal this state to the distant end connected via the V.24 cable, thereby temporarily interrupting the further inflow of data. This would not be possible if the RTS/CTS status lines were "looped through" via the air interface or if the software handshake characters were transferred via the air interface.

Advantageous embodiments of the invention are indicated in the subclaims.

One embodiment of the invention is explained with reference to FIGURE 3.

FIGURE 3 shows the wireless V.24 data transmission system according to FIGURE 2, in which the data transmission is controlled as follows:

When the wireless V.24 data transmission system is commissioned or the data terminal DEE, the data transmission device DÜE and the V.24 data transmission apparatus DÜG1, DÜG2 are activated, the V.24 data transmission apparatus DÜG1, DÜG2, the data terminal DEE and the data transmission device DÜE are operated in a command data transmission mode, in which command data KD are transmitted between the data terminal DEE and the data transmission device DÜE via the V.24 cable $K_{V.24}$ and the air interface LSS.

The command data KD transmitted in the command data transmission mode may contain, for example, first command data KD1, indicating that a "software handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states - e.g. by means of the XON/XOFF protocol - in a data stream on the data lines TxD, RxD, or may contain, for example, second command data indicating that a "hardware handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states on the status lines RTS, CTS.

As an alternative to the procedure in which the "hardware handshake" or "software handshake" transmission type which is to be set is notified by means of command data KD1, KD2, it is also possible for the "software handshake" or "hardware handshake" to be preconfigured, preferably manually.

In the event that the transmission type is preconfigured and therefore the first command data KD1 or the second command data KD2 are transmitted between the data terminal DEE and the data transmission device DÜE, preferably the first V.24 data transmission apparatus DÜG1 detects the transmission type to be set and transfers this to the second V.24 data transmission apparatus DÜG2.

Alternatively, it also possible for

1. the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set and to transfer this to the first V.24 data transmission apparatus DÜG1, or

2. the first V.24 data transmission apparatus DÜG1 and the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set.

In the last-mentioned case, the transmission type is not transferred between the V.24 data transmission apparatus DÜG1, DÜG2.

If it detects or has received the second command data KD2, the first V.24 data transmission apparatus DÜG1 switches to a first special mode SM1 assigned to the "hardware handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data terminal DEE and the first V.24 data transmission apparatus DÜG1. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS or the status lines RTS, CTS are not "looped through" via the air interface LSS.

In contrast to this, the information on the other lines or status lines of the V.24 cable $K_{V.24}$ is transmitted via the air interface LSS, or these lines are "looped through" via the air interface LSS.

If it detects or has received the first command data KD1, the first V.24 data transmission apparatus DÜG1 switches to a second special mode SM2 assigned to the "software handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the data stream transmitted between the data terminal DEE and the first V.24 data transmission apparatus DÜG1 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term "locally" means that the "RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

If it detects or has received the second command data KD2, the second V.24 data transmission apparatus DÜG2 switches to a third special mode SM3 assigned to the "hardware handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data transmission device DÜE and the second V.24 data transmission apparatus DÜG2. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS. In contrast to this, the information is transmitted on the other lines or status lines of the V.24 cable $K_{V.24}$ via the air interface LSS.

If it detects or has received the first command data KD1, the second V.24 data transmission apparatus DÜG2 switches to a fourth special mode SM4 assigned to the "software handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the data stream transmitted between the data transmission device DÜE and the second V.24 data transmission apparatus DÜG2 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term "locally" means that the

"RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

Patent claims

1. A method for controlling data transmission in a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication, wherein

the V.24 data transmission system has a first V.24 data transmission apparatus (DÜG1) and a second V.24 data transmission apparatus (DÜG2), which are interconnected via an air interface (LSS) and wherein the first V.24 data transmission apparatus (DÜG1) is connected to the data terminal (DEE), the second V.24 data transmission apparatus (DÜG2) is connected to the data transmission device (DÜE) and the data transmission device (DÜE) is connected to a remote data transmission device ($DÜE_f$) with a downstream remote data terminal (DEE_f),

with the following features:

(a) on activation of the data terminal (DEE), the data transmission device (DÜE) and the V.24 data transmission apparatus (DÜG1, DÜG2), the V.24 data transmission apparatus (DÜG1, DÜG2), the data terminal (DEE) and the data transmission device (DÜE) are operated in a command data transmission mode in which command data (KD) are transmitted between the data terminal (DEE) and the data transmission device (DÜE),

(b) a first transmission type referred to as a "software handshake" or a second transmission type referred to as a "hardware handshake" is set in that

(b1) between the data terminal (DEE) and the data transmission device (DÜE),

first command data (KD1) are transmitted, indicating that

a "software handshake" is to be performed between the data terminal (DEE) and the data transmission device (DÜE), or second command data (KD2) are transmitted, indicating that a "hardware

handshake" is to be performed between the data terminal (DEE) and the data transmission device (DÜE), or

(b2) the "software handshake" or the "hardware handshake" are preconfigured,

(c) at least one of the V.24 data transmission apparatus (DÜG1, DÜG2) detects - in case (b1) - the transmission type to be set and transfers this, if required, to the respective other V.24 data transmission apparatus (DÜG1, DÜG2),

(d) the first V.24 data transmission apparatus (DÜG1) switches to a first special mode (SM1) assigned to the "hardware handshake", in which the first V.24 data transmission apparatus (DÜG1), in relation to status lines (RTS, CTS), locally handles the "RTS", "CTS" states transmitted on these lines between the data terminal (DEE) and the first V.24 data transmission apparatus (DÜG1), or
to a second special mode (SM2) assigned to the "software handshake", in which the first V.24 data transmission apparatus (DÜG1), in relation to the data stream transmitted between the data terminal (DEE) and the first V.24 data transmission apparatus (DÜG1), locally handles the "RTS", "CTS" states transmitted in this data stream,

(e) the second V.24 data transmission apparatus (DÜG2) switches to a third special mode (SM3) assigned to the "hardware handshake", in which the second V.24 data transmission apparatus (DÜG2), in relation to the status lines (RTS, CTS), locally handles the "RTS", "CTS" states transmitted on these lines between the data transmission device (DÜE) and the second V.24 data transmission apparatus (DÜG2), or
to a fourth special mode (SM4) assigned to the "software

handshake", in which the second V.24 data transmission apparatus (DÜG2), in relation to the data stream transmitted between the data transmission device (DÜE) and the second V.24 data transmission apparatus (DÜG2),

locally handles the "RTS", "CTS" states transmitted in this data stream.

2. The method as claimed in claim 1, characterized in that the "software handshake" is carried out by means of the XON/XOFF protocol

3. The method as claimed in claim 1 or 2, characterized in that
the command data are Hayes-specific commands with the Hayes prefix "AT (Attention)".

4. The method as claimed in one of claims 1 to 3, characterized in that
a modem is used as the data transmission device and a personal computer is used as the data terminal.

5. The method as claimed in one of claims 1 to 4, characterized in that
a DECT air interface is used as the air interface.

GR 98 P 8075

Abstract

Method for controlling data transmission in a wireless V.24 data transmission system operating between a data terminal and a data transmission apparatus for data telecommunication.

In order to control the transmission of "RTS", "CTS" states in a wireless V.24 data transmission system operating between a data terminal and a data transmission apparatus for data telecommunication in such a way that reliable reciprocal notification of the state can easily be effected in the wireless V.24 data transmission system for different state transmission types (hardware handshake or software handshake), a first data transmission apparatus connected to the data transmission device by means of a V.24 cable and a second data transmission apparatus connected to the data transmission device by means of a V.24 cable, which in turn can be connected by means of wireless communication via an air interface, are operated both in hardware handshake mode and in software handshake mode in a local processing mode.

FIGURE 3

[GR 98 P 8075] S P E C I F I C A T I O N

[Description] TITLE

[Method for controlling] METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL
AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention pertains to data transmission in [a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication] wireless systems, and in particular to interchange circuits between data terminal equipment and data communication equipment.

Description of the Related Art

Data telecommunication (Datel) is the reciprocal transmission and reception of data or data signals (packet data) between a data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - and a remote data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - via a telecommunications network, for example a public telecommunications network [(Stw.](Such as: ISDN, PSTN, etc.). So that the data or data signals transmitted by the data terminal can be transmitted via the telecommunications network, a technical network apparatus, referred to as the data transmission device, is provided between the data terminal and the telecommunications network. The most commonly used data transmission device, along with the PC card (formerly known as the PCMCIA card), is the modem (artificial word made up from modulator/demodulator) [cf., inter alia, utility model DE 297 14 588 U1].

The modem is an electrical data transmission device operating on the basis of the carrier method for use on limited-bandwidth analog transmission paths - e.g. telecommunications lines (e.g. a/b line pair, ISDN-S_0 bus, etc.) of the telecommunications network, which converts digital data signals into analog data signals and vice versa, and transmits said signals. A multiplicity of V-series methods standardized by the International Telecommunication Union - Telecommunication Standards (ITU-T) are implemented in modems.

FIGURE 1 shows a data telecommunication scenario on the basis of a V.24 data transmission system. A V.24 data transmission system is connected via a public - e.g. a PSTN (Public Switched Telecommunication Network) having an a/b line pair or an ISDN (Integrated Services Digital Network) having an ISDN-S_0 bus - telecommunications network to the remote V.24 data transmission system. The V.24 data transmission system has a data terminal DEE, e.g. designed as a personal computer, and a data transmission device DÜE designed as a modem, which are interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

Analogously, the remote V.24 data transmission system has a remote data terminal DEE_f, e.g. designed as a personal computer, and a remote data transmission device $DÜE_f$, e.g. designed as a modem, which are likewise interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

The data terminal DEE, DEE_f contains a system controller SST with a user interface BOF, application software ASW and a driver TR as an adapter between the software (application software) and the hardware (data transmission device or modem).

The driver TR is modem-vendor-specific and is preferably designed as a CAPI driver (Common ISDN Application Programmable Interface; standardized

communications interface with the application software for fault-tolerant ISDN telecommunication with the personal computer) or as a TAPI driver (Telephone Application Programmable Interface).

A multiplicity of data transmission apparatus DÜE which are available on the market, e.g. analog modems and PC-external ISDN terminal adapters, are controlled via a HAYES command set (HAYES standard). The HAYES standard was originally an American industry standard for modem communication, in particular for modem control by the data terminal DEE. It is also referred to as the AT standard, since virtually all commands from the HAYES command set begin with the prefix "AT" (ATtention) with the ASCII characters A and T. The standard, which has since been introduced worldwide, is the subject of an ITU recommendation (International Telecommunication Union) with the title "ITU-T V.25ter". The prefix "at", the prefix "A/" or the prefix "a/" can also be used instead of the prefix "AT".

According to ITU-T specification V.24, March 1993, pages 1 to 19, the V.24 cable or V.24 interface $K_{V.24}$ supports modem operation on a personal computer through different lines (status lines). These are:

1. A transmit data line TxD for data transmission,
2. a receive data line RxD for data transmission,
3. an RTS line (Ready To Send) RTS for the "hardware-handshake" transmission type for transmission of the "READY TO SEND" state ("RTS" state),
4. a CTS line (Clear To Send") CTS for the "hardware-handshake" transmission type for transmission of the "CLEAR TO SEND" state ("CTS" state),
5. an RI line (Ring Indication) RI for ring detection, on the modem,

6. a DSR line (DATA SET READY) DSR, on which the modem signals to the personal computer that it is activated,

7. a DTR line (DATA TERMINAL READY) DTR, on which the personal computer signals to the modem that it is activated and ready to accept connections,

8. a DCD line (DATA CHANNEL DETECTION) DCD, on which the modem signals to the personal computer that it has accepted or set up the connection to a remote modem,

9. A ground line (GrouND) GND.

If the V.24 cable or V.24 interface $K_{V.24}$ does not have the nine lines listed above, but has less than nine, e.g. seven, this 7-pin cable can nevertheless support modem operation on the personal computer.

This is done by effecting a "software handshake" instead of the "hardware handshake" on the RTS/CTS line in order to transmit the "RTS", "CTS" states - e.g. by means of an XON/XOFF protocol - on the transmit/receive data lines TxD, RxD. With the "software handshake", the data stream transmitted between the data terminal DEE and the data transmission device DÜE is analyzed, all "software handshake characters" are interpreted and appropriate measures are instigated in the data terminal DEE and the data transmission device DÜE.

The line-connected V.24 data transmission system shown in FIGURE 1 presents the disadvantage, in the case of an application scenario in which the data terminal DEE and the data transmission device DÜE are physically separated from one another, e.g. over several meters, that, firstly, for data telecommunication, a correspondingly long V.24 cable $K_{V.24}$ is required in relation to the physical arrangement of the data terminal DEE and the data transmission device DÜE and that, secondly, significantly high

system installation costs are incurred due to the cable laying required for cables of this length.

By analogy with wireless telephony, it is therefore desirable and also conceivable for the line-connected V.24 data transmission system according to FIGURE 1 to be replaced with a wireless V.24 data transmission system.

On the basis of FIGURE 1, FIGURE 2 shows a wireless V.24 data transmission system of this type for data telecommunication. The remote V.24 data transmission system, which is not fully shown in FIGURE 2, may either be line-connected according to FIGURE 1 or wireless in the same way as the wireless V.24 data transmission system in FIGURE 2.

In the wireless V.24 data transmission system, in contrast to the line-connected V.24 data transmission system in FIGURE 1, the V.24 cable and V.24 interface $K_{V.24}$ are disconnected between the data terminal DEE and the data transmission device DÜE and a data transmission apparatus is in each case connected to the two ends of the cable created by the disconnection.

The two data transmission apparatus, a first data transmission apparatus DÜG1 which is connected to the data terminal DEE via the V.24 cable or V.24 interface $K_{V.24}$ and a second data transmission apparatus DÜG2 which is connected to the data transmission device DÜE via the V.24 cable or V.24 interface $K_{V.24}$ are interconnected via an air interface LSS for wireless telecommunication.

Air interfaces are wireless telecommunication interfaces in which messages are transmitted by wireless means via a remote transmission path between a message source (e.g. first data transmission apparatus DÜG1) and a message sink (e.g. second data transmission apparatus DÜG2) on the basis of diverse communications methods

FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and/or CDMA (Code Division Multiple Access) - e.g. according to radio standards such as DECT [Digital Enhanced (formerly: European) Cordless Telecommunication; cf. Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29 in conjunction with ETSI Publication ETS 300175-[1.9] 1...9, October 1992, and the DECT publication of the DECT Forum, February 1997, pages 1 to 16], GSM [Groupe Spécial Mobile or Global System for Mobile Communication; cf. Informatik Spektrum 14 (1991), June, Issue 3, Berlin, DE; A. Mann: "Der GSM Standard - Grundlage für digitale europäische Mobilfunknetze" ["The GSM Standard - Foundation for Digital European Mobile Networks"], pages 137 to 152 in conjunction with the publication telekom praxis 4/1993, P. Smolka "GSM Funkschnittstelle - Elemente und Funktionen" ["GSM Radio Interface - Elements and Functions"], pages 17 to 24], UMTS [cf. Funkschau 6/98: R. Sietmann "Ringen um die UMTS Schnittstelle" ["The Fight for the UMTS Interface"], pages 76 to 81], WACS or PACS, IS-54, IS-95, PHS, PDC, etc. [cf. IEEE Communications Magazine, January 1995, pages 50 to 57; D.D. Falconer et al: "Time Division Multiple Access Methods for Wireless Personal Communications"].

In FIGURE 2, the DECT air interface is preferably provided as the air interface LSS. According to the publication "Vortrag von A. Elberse, M. Barry, G. Fleming zum Thema [Presentation by A. Elberse, M. Barry, G. Fleming on the subject of]: "DECT Data services - DECT in Fixed and Mobile Networks", June 17/18, 1996, Hotel Sofitel, Paris; pages 1 to 12 and abstract" - on the basis of the document Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29 in conjunction with

ETSI Publication ETS 300175-[1.9] 1..9, October 1992 and the documents Components 31 (1993), Issue 6, pages 215 to 218; S. Althammer, D. Brückmann: "Hochoptimierte IC's für DECT Schnürlostelefone" ["Highly Optimized ICs for DECT wireless telephones"] and WO 96/38991 (cf. Figures 5 and 6 with the relevant associated description) - the essential usability of DECT technology (Digital Enhanced Cordless Telecommunication], DECT technology is suitable for wireless mobile remote transmission of voice and/or packet data, in which the user, by means of DECT network access technology relating to the remote transmission of user data, can not only become his own network operator but also has the facility to access a higher-order telecommunications network.

SUMMARY OF THE INVENTION

In a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication, the object on which the invention is based entails the control of the transmission of the states "RTS", "CTS" in such a way that reliable reciprocal notification of the state is effected in the wireless V.24 data transmission system in a simple manner for different state transmission types (hardware handshake or software handshake).[This object is achieved by the features of claim 1.]

The idea on which the object is based consists in that, in a wireless V.24 data transmission system operating between a data terminal (e.g. a personal computer) and a data transmission device (e.g. a modem) for data telecommunication, a first data transmission apparatus connected to the data terminal via a V.24 cable and a second data transmission apparatus connected to the data transmission device via a V.24

cable, which in turn can be connected by means of wireless telecommunication via an air interface,

a) in "hardware handshake mode" for transmission of the "RTS", "CTS" states in which status lines RTS, CTS are used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted on these lines in relation to the RTS/CTS status lines,

b) in "software handshake mode" for transmission of the "RTS", "CTS" states in which a data stream transmitted on data lines is used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted in this data stream in relation to this data stream.

This enables the respective V.24 data transmission apparatus, if the input buffer in the relevant V.24 data transmission apparatus overflows with data arriving in the device, to signal this state to the distant end connected via the V.24 cable, thereby temporarily interrupting the further inflow of data. This would not be possible if the RTS/CTS status lines were "looped through" via the air interface or if the software handshake characters were transferred via the air interface.

DESCRIPTION OF THE DRAWINGS

Figure 1 shows a data transmission system where the data terminal and the data transmission device are connected via a V.24 cable.

Figure 2 shows a data transmission system with wireless V.24 connection apparatus.

Figure 3 shows a data transmission system with wireless V.24 connection apparatus according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS [Advantageous embodiments of the invention are indicated in the subclaims.]

One embodiment of the invention is explained with reference to FIGURE 3.

FIGURE 3 shows the wireless V.24 data transmission system according to FIGURE 2, in which the data transmission is controlled as follows:

When the wireless V.24 data transmission system is commissioned or the data terminal DEE, the data transmission device DÜE and the V.24 data transmission apparatus DÜG1, DÜG2 are activated, the V.24 data transmission apparatus DÜG1, DÜG2, the data terminal DEE and the data transmission device DÜE are operated in a command data transmission mode, in which command data KD are transmitted between the data terminal DEE and the data transmission device DÜE via the V.24 cable KV.24 and the air interface LSS.

The command data KD transmitted in the command data transmission mode may contain, for example, first command data KD1, indicating that a "software handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states - e.g. by means of the XON/XOFF protocol - in a data stream on the data lines TxD, RxD, or may contain, for example, second command data indicating that a "hardware handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states on the status lines RTS, CTS.

As an alternative to the procedure in which the "hardware handshake" or "software handshake" transmission type which is to be set is notified by means of command data KD1, KD2, it is also possible for the "software handshake" or "hardware handshake" to be preconfigured, preferably manually.

In the event that the transmission type is preconfigured and therefore the first command data KD1 or the second command data KD2 are transmitted between the data terminal DEE and the data transmission device DÜE, preferably the first V.24 data transmission apparatus DÜG1 detects the transmission type to be set and transfers this to the second V.24 data transmission apparatus DÜG2. [

]Alternatively, it also possible for[ ]

1. the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set and to transfer this to the first V.24 data transmission apparatus DÜG1, or

2. the first V.24 data transmission apparatus DÜG1 and the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set.

In the last-mentioned case, the transmission type is not transferred between the V.24 data transmission apparatus DÜG1, DÜG2.

If it detects or has received the second command data KD2, the first V.24 data transmission apparatus DÜG1 switches to a first special mode SM1 assigned to the "hardware handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data terminal DEE and the first V.24 data transmission apparatus DÜG1. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS or the status lines RTS, CTS are not "looped through" via the air interface LSS.

In contrast to this, the information on the other lines or status lines of the V.24 cable KV.24 is transmitted via the air interface LSS, or these lines are "looped through" via the air interface LSS.

If it detects or has received the first command data KD1, the first V.24 data transmission apparatus DÜG1 switches to a second special mode SM2 assigned to the "software handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the data stream transmitted between the data terminal DEE and the first V.24 data transmission apparatus DÜG1 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term "locally" means that the "RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

If it detects or has received the second command data KD2, the second V.24 data transmission apparatus DÜG2 switches to a third special mode SM3 assigned to the "hardware handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data transmission device DÜE and the second V.24 data transmission apparatus DÜG2. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS. In contrast to this, the information is transmitted on the other lines or status lines of the V.24 cable KV.24 via the air interface LSS.

If it detects or has received the first command data KD1, the second V.24 data transmission apparatus DÜG2 switches to a fourth special mode SM4 assigned to the "software handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the data stream transmitted between the data transmission device DÜE

and the second V.24 data transmission apparatus DÜG2 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term "locally" means that the "RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

[Abstract] Although other modifications and changes may be suggested by those skilled in the art, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of their contribution to the art.

[Method for controlling data transmission in a wireless V.24 data transmission system operating between a data terminal and a data transmission apparatus for data telecommunication.] **ABSTRACT OF THE DISCLOSURE**

In order to control the transmission of "RTS", "CTS" states in a wireless V.24 data transmission system operating between a data terminal and a data transmission apparatus for data [

]telecommunication in such a way that reliable reciprocal notification of the state can easily be effected in the wireless V.24 data transmission system for different state transmission types (hardware handshake or software handshake), a first data transmission apparatus connected to [

]the data transmission device by means of a V.24 cable and a second data transmission apparatus connected to the data transmission device by means of a V.24 cable, which in turn can be connected by means of wireless communication via an air interface, are operated both in hardware handshake mode and in software handshake mode in a local processing mode.

[

FIGURE 3]

SPECIFICATION

TITLE

METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention pertains to data transmission in wireless systems, and in particular to interchange circuits between data terminal equipment and data communication equipment.

Description of the Related Art

Data telecommunication (Datel) is the reciprocal transmission and reception of data or data signals (packet data) between a data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - and a remote data terminal - e.g. a personal computer, data terminals, data-processing systems, etc. - via a telecommunications network, for example a public telecommunications network (Such as: ISDN, PSTN, etc.). So that the data or data signals transmitted by the data terminal can be transmitted via the telecommunications network, a technical network apparatus, referred to as the data transmission device, is provided between the data terminal and the telecommunications network. The most commonly used data transmission device, along with the PC card (formerly known as the PCMCIA card), is the modem (artificial word made up from modulator/demodulator) [cf., inter alia, utility model DE 297 14 588 U1].

The modem is an electrical data transmission device operating on the basis of the carrier method for use on limited-bandwidth analog transmission paths - e.g. telecommunications lines (e.g. a/b line pair, ISDN-S_0 bus, etc.) of the

telecommunications network, which converts digital data signals into analog data signals and vice versa, and transmits said signals. A multiplicity of V-series methods standardized by the International Telecommunication Union - Telecommunication Standards (ITU-T) are implemented in modems.

FIGURE 1 shows a data telecommunication scenario on the basis of a V.24 data transmission system. A V.24 data transmission system is connected via a public - e.g. a PSTN (Public Switched Telecommunication Network) having an a/b line pair or an ISDN (Integrated Services Digital Network) having an ISDN-S_0 bus - telecommunications network to the remote V.24 data transmission system. The V.24 data transmission system has a data terminal DEE, e.g. designed as a personal computer, and a data transmission device DÜE designed as a modem, which are interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

Analogously, the remote V.24 data transmission system has a remote data terminal DEE_f, e.g. designed as a personal computer, and a remote data transmission device $DÜE_f$, e.g. designed as a modem, which are likewise interconnected via a V.24 cable (V.24 interface) $K_{V.24}$.

The data terminal DEE, DEE_f contains a system controller SST with a user interface BOF, application software ASW and a driver TR as an adapter between the software (application software) and the hardware (data transmission device or modem).

The driver TR is modem-vendor-specific and is preferably designed as a CAPI driver (Common ISDN Application Programmable Interface; standardized communications interface with the application software for fault-tolerant ISDN telecommunication with the personal computer) or as a TAPI driver (Telephone Application Programmable Interface).

A multiplicity of data transmission apparatus DÜE which are available on the market, e.g. analog modems and PC-external ISDN terminal adapters, are controlled via a HAYES command set (HAYES standard). The HAYES standard was originally an American industry standard for modem communication, in particular for modem control by the data terminal DEE. It is also referred to as the AT standard, since virtually all commands from the HAYES command set begin with the prefix "AT" (ATtention) with the ASCII characters A and T. The standard, which has since been introduced worldwide, is the subject of an ITU recommendation (International Telecommunication Union) with the title "ITU-T V.25ter". The prefix "at", the prefix "A/" or the prefix "a/" can also be used instead of the prefix "AT".

According to ITU-T specification V.24, March 1993, pages 1 to 19, the V.24 cable or V.24 interface $K_{V.24}$ supports modem operation on a personal computer through different lines (status lines). These are:

1. A transmit data line TxD for data transmission,
2. a receive data line RxD for data transmission,
3. an RTS line (Ready To Send) RTS for the "hardware-handshake" transmission type for transmission of the "READY TO SEND" state ("RTS" state),
4. a CTS line (Clear To Send") CTS for the "hardware-handshake" transmission type for transmission of the "CLEAR TO SEND" state ("CTS" state),
5. an RI line (Ring Indication) RI for ring detection, on the modem,
6. a DSR line (DATA SET READY) DSR, on which the modem signals to the personal computer that it is activated,
7. a DTR line (DATA TERMINAL READY) DTR, on which the personal computer signals to the modem that it is activated and ready to accept connections,

8. a DCD line (DATA CHANNEL DETECTION) DCD, on which the modem signals to the personal computer that it has accepted or set up the connection to a remote modem,

9. A ground line (GrouND) GND.

If the V.24 cable or V.24 interface $K_{V.24}$ does not have the nine lines listed above, but has less than nine, e.g. seven, this 7-pin cable can nevertheless support modem operation on the personal computer.

This is done by effecting a "software handshake" instead of the "hardware handshake" on the RTS/CTS line in order to transmit the "RTS", "CTS" states - e.g. by means of an XON/XOFF protocol - on the transmit/receive data lines TxD, RxD. With the "software handshake", the data stream transmitted between the data terminal DEE and the data transmission device DÜE is analyzed, all "software handshake characters" are interpreted and appropriate measures are instigated in the data terminal DEE and the data transmission device DÜE.

The line-connected V.24 data transmission system shown in FIGURE 1 presents the disadvantage, in the case of an application scenario in which the data terminal DEE and the data transmission device DÜE are physically separated from one another, e.g. over several meters, that, firstly, for data telecommunication, a correspondingly long V.24 cable $K_{V\,24}$ is required in relation to the physical arrangement of the data terminal DEE and the data transmission device DÜE and that, secondly, significantly high system installation costs are incurred due to the cable laying required for cables of this length.

By analogy with wireless telephony, it is therefore desirable and also conceivable for the line-connected V.24 data transmission system according to FIGURE 1 to be replaced with a wireless V.24 data transmission system.

On the basis of FIGURE 1, FIGURE 2 shows a wireless V.24 data transmission system of this type for data telecommunication. The remote V.24 data transmission system, which is not fully shown in FIGURE 2, may either be line-connected according to FIGURE 1 or wireless in the same way as the wireless V.24 data transmission system in FIGURE 2.

In the wireless V.24 data transmission system, in contrast to the line-connected V.24 data transmission system in FIGURE 1, the V.24 cable and V.24 interface $K_{V.24}$ are disconnected between the data terminal DEE and the data transmission device DÜE and a data transmission apparatus is in each case connected to the two ends of the cable created by the disconnection.

The two data transmission apparatus, a first data transmission apparatus DÜG1 which is connected to the data terminal DEE via the V.24 cable or V.24 interface $K_{V.24}$ and a second data transmission apparatus DÜG2 which is connected to the data transmission device DÜE via the V.24 cable or V.24 interface $K_{V.24}$ are interconnected via an air interface LSS for wireless telecommunication.

Air interfaces are wireless telecommunication interfaces in which messages are transmitted by wireless means via a remote transmission path between a message source (e.g. first data transmission apparatus DÜG1) and a message sink (e.g. second data transmission apparatus DÜG2) on the basis of diverse communications methods FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and/or CDMA (Code Division Multiple Access) - e.g. according to radio standards

such as DECT [Digital Enhanced (formerly: European) Cordless Telecommunication; cf. Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29 in conjunction with ETSI Publication ETS 300175-1...9, October 1992, and the DECT publication of the DECT Forum, February 1997, pages 1 to 16], GSM [Groupe Spécial Mobile or Global System for Mobile Communication; cf. Informatik Spektrum 14 (1991), June, Issue 3, Berlin, DE; A. Mann: "Der GSM Standard - Grundlage für digitale europäische Mobilfunknetze" ["The GSM Standard - Foundation for Digital European Mobile Networks"], pages 137 to 152 in conjunction with the publication telekom praxis 4/1993, P. Smolka "GSM Funkschnittstelle - Elemente und Funktionen" ["GSM Radio Interface - Elements and Functions"], pages 17 to 24], UMTS [cf. Funkschau 6/98: R. Sietmann "Ringen um die UMTS Schnittstelle" ["The Fight for the UMTS Interface"], pages 76 to 81], WACS or PACS, IS-54, IS-95, PHS, PDC, etc. [cf. IEEE Communications Magazine, January 1995, pages 50 to 57; D.D. Falconer et al: "Time Division Multiple Access Methods for Wireless Personal Communications"].

In FIGURE 2, the DECT air interface is preferably provided as the air interface LSS. According to the publication "Vortrag von A. Elberse, M. Barry, G. Fleming zum Thema [Presentation by A. Elberse, M. Barry, G. Fleming on the subject of]: "DECT Data services - DECT in Fixed and Mobile Networks", June 17/18, 1996, Hotel Sofitel, Paris; pages 1 to 12 and abstract" - on the basis of the document Nachrichtentechnik Elektronik 42 (1992) Jan./Feb. Issue 1, Berlin, DE; U. Pilger "Struktur des DECT Standards" ["Structure of the DECT Standard"], pages 23 to 29 in conjunction with ETSI Publication ETS 300175-1..9, October 1992 and the documents Components 31 (1993), Issue 6, pages 215 to 218; S. Althammer, D. Brückmann: "Hochoptimierte IC's

für DECT Schnürlostelefone" ["Highly Optimized ICs for DECT wireless telephones"] and WO 96/38991 (cf. Figures 5 and 6 with the relevant associated description) - the essential usability of DECT technology (Digital Enhanced Cordless Telecommunication], DECT technology is suitable for wireless mobile remote transmission of voice and/or packet data, in which the user, by means of DECT network access technology relating to the remote transmission of user data, can not only become his own network operator but also has the facility to access a higher-order telecommunications network.

SUMMARY OF THE INVENTION

In a wireless V.24 data transmission system operating between a data terminal and a data transmission device for data telecommunication, the object on which the invention is based entails the control of the transmission of the states "RTS", "CTS" in such a way that reliable reciprocal notification of the state is effected in the wireless V.24 data transmission system in a simple manner for different state transmission types (hardware handshake or software handshake).

The idea on which the object is based consists in that, in a wireless V.24 data transmission system operating between a data terminal (e.g. a personal computer) and a data transmission device (e.g. a modem) for data telecommunication, a first data transmission apparatus connected to the data terminal via a V.24 cable and a second data transmission apparatus connected to the data transmission device via a V.24 cable, which in turn can be connected by means of wireless telecommunication via an air interface,

a) in "hardware handshake mode" for transmission of the "RTS", "CTS" states in which status lines RTS, CTS are used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted on these lines in relation to the RTS/CTS status lines,

b) in "software handshake mode" for transmission of the "RTS", "CTS" states in which a data stream transmitted on data lines is used, in each case switch to a local processing mode in which the respective V.24 data transmission apparatus locally processes the "RTS", "CTS" states transmitted in this data stream in relation to this data stream.

This enables the respective V.24 data transmission apparatus, if the input buffer in the relevant V.24 data transmission apparatus overflows with data arriving in the device, to signal this state to the distant end connected via the V.24 cable, thereby temporarily interrupting the further inflow of data. This would not be possible if the RTS/CTS status lines were "looped through" via the air interface or if the software handshake characters were transferred via the air interface.

DESCRIPTION OF THE DRAWINGS

Figure 1 shows a data transmission system where the data terminal and the data transmission device are connected via a V.24 cable.

Figure 2 shows a data transmission system with wireless V.24 connection apparatus.

Figure 3 shows a data transmission system with wireless V.24 connection apparatus according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment of the invention is explained with reference to FIGURE 3.

FIGURE 3 shows the wireless V.24 data transmission system according to FIGURE 2, in which the data transmission is controlled as follows:

When the wireless V.24 data transmission system is commissioned or the data terminal DEE, the data transmission device DÜE and the V.24 data transmission apparatus DÜG1, DÜG2 are activated, the V.24 data transmission apparatus DÜG1, DÜG2, the data terminal DEE and the data transmission device DÜE are operated in a command data transmission mode, in which command data KD are transmitted between the data terminal DEE and the data transmission device DÜE via the V.24 cable KV.24 and the air interface LSS.

The command data KD transmitted in the command data transmission mode may contain, for example, first command data KD1, indicating that a "software handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states - e.g. by means of the XON/XOFF protocol - in a data stream on the data lines TxD, RxD, or may contain, for example, second command data indicating that a "hardware handshake" is to be performed between the data terminal DEE and the data transmission device DÜE for transmission of the "RTS", "CTS" states on the status lines RTS, CTS.

As an alternative to the procedure in which the "hardware handshake" or "software handshake" transmission type which is to be set is notified by means of command data KD1, KD2, it is also possible for the "software handshake" or "hardware handshake" to be preconfigured, preferably manually.

In the event that the transmission type is preconfigured and therefore the first command data KD1 or the second command data KD2 are transmitted between the data terminal DEE and the data transmission device DÜE, preferably the first V.24 data transmission apparatus DÜG1 detects the transmission type to be set and transfers this to the second V.24 data transmission apparatus DÜG2. Alternatively, it also possible for

1. the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set and to transfer this to the first V.24 data transmission apparatus DÜG1, or

2. the first V.24 data transmission apparatus DÜG1 and the second V.24 data transmission apparatus DÜG2 to detect the transmission type to be set.

In the last-mentioned case, the transmission type is not transferred between the V.24 data transmission apparatus DÜG1, DÜG2.

If it detects or has received the second command data KD2, the first V.24 data transmission apparatus DÜG1 switches to a first special mode SM1 assigned to the "hardware handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data terminal DEE and the first V.24 data transmission apparatus DÜG1. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS or the status lines RTS, CTS are not "looped through" via the air interface LSS.

In contrast to this, the information on the other lines or status lines of the V.24 cable KV.24 is transmitted via the air interface LSS, or these lines are "looped through" via the air interface LSS.

If it detects or has received the first command data KD1, the first V.24 data transmission apparatus DÜG1 switches to a second special mode SM2 assigned to the "software handshake", in which the first V.24 data transmission apparatus DÜG1, in relation to the data stream transmitted between the data terminal DEE and the first V.24 data transmission apparatus DÜG1 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term "locally" means that the "RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

If it detects or has received the second command data KD2, the second V.24 data transmission apparatus DÜG2 switches to a third special mode SM3 assigned to the "hardware handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the status lines RTS, CTS, locally handles the "RTS", "CTS" states transmitted on these lines between the data transmission device DÜE and the second V.24 data transmission apparatus DÜG2. The term "locally" means that the "RTS", "CTS" states on the status lines RTS, CTS are not transmitted via the air interface LSS. In contrast to this, the information is transmitted on the other lines or status lines of the V.24 cable KV.24 via the air interface LSS.

If it detects or has received the first command data KD1, the second V.24 data transmission apparatus DÜG2 switches to a fourth special mode SM4 assigned to the "software handshake", in which the second V.24 data transmission apparatus DÜG2, in relation to the data stream transmitted between the data transmission device DÜE and the second V.24 data transmission apparatus DÜG2 on the data lines TxD, RxD, locally handles the "RTS", "CTS" states transmitted in this data stream. The term

"locally" means that the "RTS", "CTS" states and software handshake characters are not transmitted via the air interface LSS.

Although other modifications and changes may be suggested by those skilled in the art, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of their contribution to the art.

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"REQUEST FOR APPROVAL OF DRAWING CHANGES"

APPLICANT: Rolf BIEDERMANN et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE99/02417

INTERNATIONAL FILING DATE: 4 August 1999

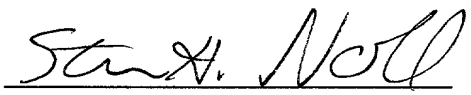
INVENTION: METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

SIR:

Applicants herewith request approval of the drawing changes in each of Figures 1, 2 and 3, as shown on the drawing copies marked in red attached hereto.

Respectfully submitted,



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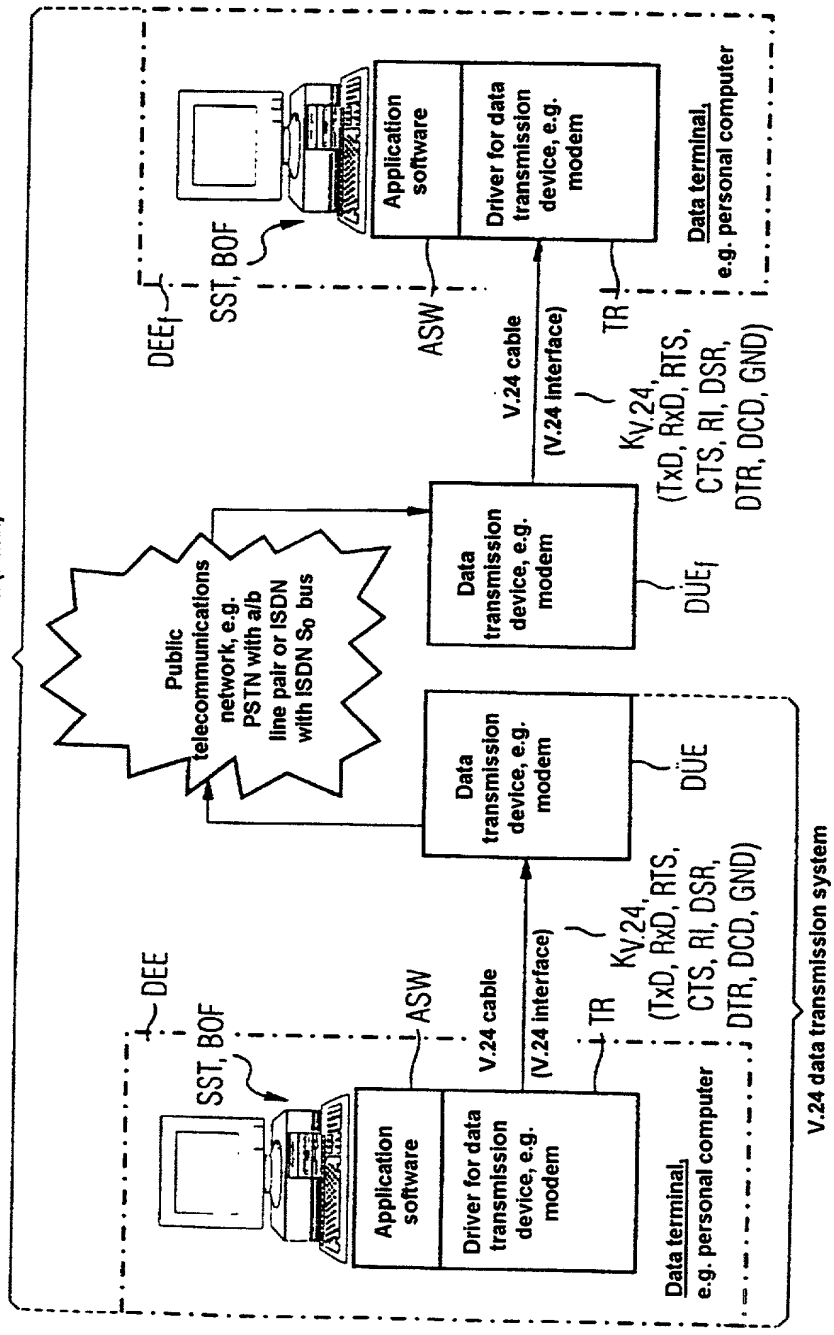
ATTORNEY FOR APPLICANT

FIG 1


Date telecommunication (Datel)
DEE
SST, BOF
Application software
Driver for data transmission device, e.g. modem
Data terminal, e.g. personal computer
ASW
V.24 cable
(V.24 interface)
TR
KV.24, (TxD, RxD, RTS, CTS, RI, DSR, DTR, DCD, GND)
Data transmission device, e.g. modem
DÜE
Public telecommunications network, e.g. PSTN with a/b line pair or ISDN with ISDN S0 bus
Data transmission device, e.g. modem
DÜEf
V.24 cable
(V.24 interface)
KV.24, (TxD, RxD, RTS, CTS, RI, DSR, DTR, DCD, GND)
TR
ASW
SST, BOF
DEEf
Application software
Driver for data transmission device, e.g. modem
Data terminal, e.g. personal computer
V.24 data transmission system

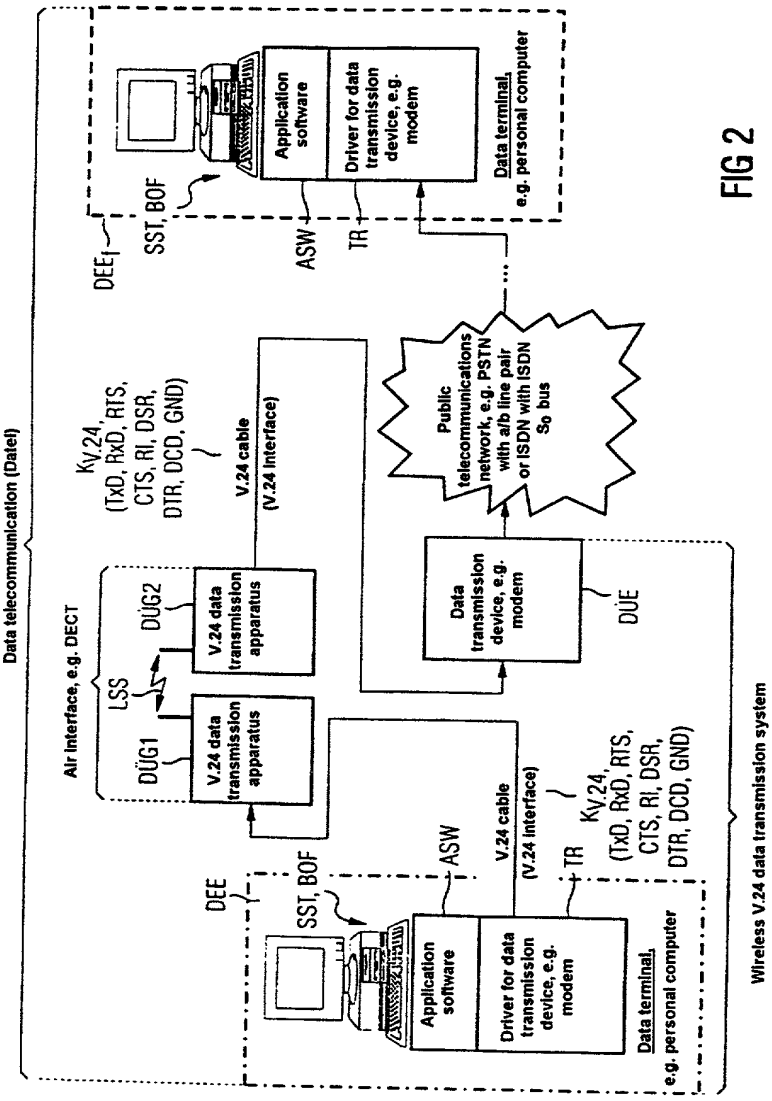
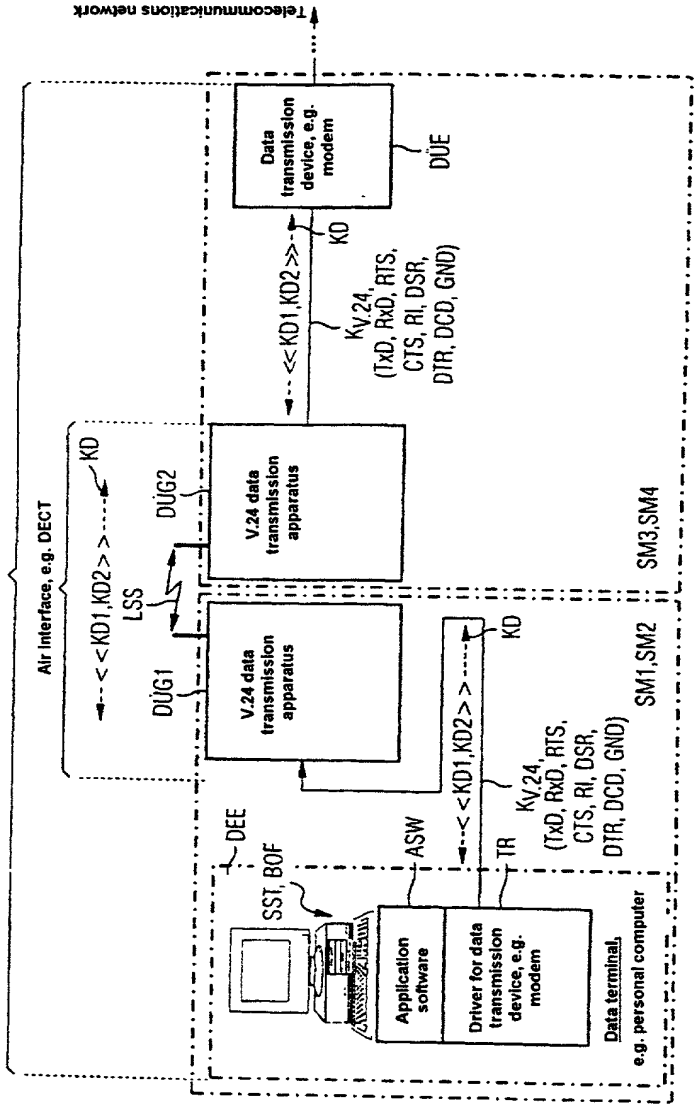

Data telecommunication (Datel)
Air interface, e.g. DECT
Wireless V.24 data transmission system
DEE
SST, BOF
ASW
TR
DÜG1
DÜG2
LSS
V.24 data transmission apparatus
V.24 cable (V.24 interface)
Kv.24, (TxD, RxD, RTS, CTS, RI, DSR, DTR, DCD, GND)
Application software
Driver for data transmission device, e.g. modem
Data terminal, e.g. personal computer
Public telecommunications network, e.g. PSTN with a/b line pair or ISDN with ISDN S0 bus
Data transmission device, e.g. modem
DÜE

FIG 2

FIG 3


Telecommunications network
Wireless V.24 data transmission system
Air interface, e.g. DECT
Data transmission device, e.g. modem
DÜE
KD
<<KD1,KD2>>
KV.24, (TxD, RxD, RTS, CTS, RI, DSR, DTR, DCD, GND)
V.24 data transmission apparatus
DÜG2
LSS
DÜG1
SM3,SM4
SM1,SM2
DEE
SST, BOF
ASW
TR
Application software
Driver for data transmission device, e.g. modem
Data terminal, e.g. personal computer

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
ERKLÄRUNG FÜR PATENTANMELDUNGEN MIT VOLLMACHT
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für des dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

VERFAHREN ZUM STEUERN DER DATENÜBERTRAGUNG IN EINEM SCHNURLOSEN ZWISCHEN EINER DATENENDEINRICHTUNG UND EINER DATENÜBERTRAGUNGSEINRICHTUNG ZUR DATEN-TELEKOMMUNIKATION BETRIEBENEN V.24-DATENÜBERTRAGUNGSSYSTEM

METHOD FOR CONTROLLING DATA TRANSMISSION IN A WIRELESS V.24 DATA TRANSMISSION SYSTEM OPERATING BETWEEN A DATA TERMINAL AND A DATA TRANSMISSION DEVICE FOR DATA TELECOMMUNICATION

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)

(check one)

☐ hier beigefügt ist.

☐ is attached hereto

■ am 4 August 1998 als PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE99/02417
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert)

■ was filed on _____ as PCT international application
PCT Application No. _____
and was amended on _____ (if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign applications
Priorität beansprucht

			Priority Claimed	
198 36 574.8	Germany	12 August 1998	■	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein

Ich beanspruche hiermit germäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122 I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Eklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

And I hereby appoint all Attorneys identified by United States Patent and Trademark Office customer number 26574, who are all members of the firm of Schiff Hardin and Waite.

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Direct Telephone Calls to: (name and telephone number)

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CUSTOMER NUMBER 26574

Voller Name des einzigen oder ursprünglichen Erfinders: Rolf BIEDERMANN	Full name of sole or first inventor:
Unterschrift des Erfinders Datum X [signature] X 9.4.01	Inventor's signature Date
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D-48683 Ahaus, GERMANY	

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(Supply similar information and signature for subsequent joint inventors).

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Unterschrift des Erfinders X K. Mühle X Datum 7.4.2001	Inventor's signature Date
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Staatsangehörigkeit German	Citizenship
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Unterschrift des Erfinders Datum	Inventor's signature Date
Wohnsitz	Residence
Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address
Voller Name des vierten Miterfinders (falls zuttreffend):	Full name of fourth joint inventor, if any:
Unterschrift des Erfinders Datum	Inventor's signature Date
Wohnsitz	Residence
Staatsangehörigkeit	Citizenship
	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von zweiten und weiteren Miterfindern angeben).

(Supply similar information and signature for second and subsequent joint inventors).